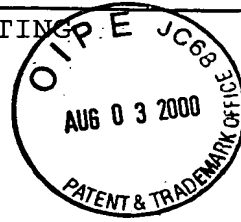


SEQUENCE LISTING



<110> LONGACRE-ANDRE, SHIRLEY
ROTH, CHARLES
BARNWELL, JOHN
MENDIS, KAMINI
NATO, FARIDABANO

<120> RECOMBINANT PROTEIN CONTAINING A C-TERMINAL FRAGMENT OF
PLASMODIUM MSP-1

<130> 0660-0139-OXPCT

<140> 09/125,031

<141> 1999-03-10

<150> PCT/FR97/00290

<151> 1997-02-14

<150> FR96/01822

<151> 1996-02-14

<160> 15

<170> PatentIn Ver. 2.1

<210> 1

<211> 291

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: SYNTHETIC

<220>

<221> CDS

<222> (1)..(291)

<400> 1

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| gaa | ttc | aac | atc | tcg | cag | cac | caa | tgc | gtg | aaa | aaa | caa | tgt | ccc | gag | 48 |
| Glu | Phe | Asn | Ile | Ser | Gln | His | Gln | Cys | Val | Lys | Lys | Gln | Cys | Pro | Glu | |
| 1 | | | | 5 | | | | 10 | | | | | 15 | | | |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| aac | tct | ggc | tgt | ttc | aga | cac | ttg | gac | gag | aga | gag | gag | tgt | aaa | tgt | 96 |
| Asn | Ser | Gly | Cys | Phe | Arg | His | Leu | Asp | Glu | Arg | Glu | Glu | Cys | Lys | Cys | |
| | | | 20 | | | | | 25 | | | | | 30 | | | |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| ctg | ctg | aac | tac | aaa | cag | gag | ggc | gac | aag | tgc | gtg | gag | aac | ccc | aac | 144 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Leu | Asn | Tyr | Lys | Gln | Glu | Gly | Asp | Lys | Cys | Val | Glu | Asn | Pro | Asn | |
| | | 35 | | | | | 40 | | | | | 45 | | | | |
| ccg | acc | tgt | aac | gag | aac | aac | ggc | ggc | tgt | gac | gca | gac | gcc | aaa | tgc | 192 |
| Pro | Thr | Cys | Asn | Glu | Asn | Asn | Gly | Gly | Cys | Asp | Ala | Asp | Ala | Lys | Cys | |
| | 50 | | | | | 55 | | | | | 60 | | | | | |
| acc | gag | gag | gac | tcg | ggc | agc | aac | ggc | aag | aaa | atc | acg | tgt | gag | tgt | 240 |
| Thr | Glu | Glu | Asp | Ser | Gly | Ser | Asn | Gly | Lys | Lys | Ile | Thr | Cys | Glu | Cys | |
| | 65 | | | | 70 | | | | 75 | | | | | | 80 | |
| acc | aaa | ccc | gac | tcg | tac | ccg | ctg | ttc | gac | ggc | atc | ttc | tgc | agc | taa | 288 |
| Thr | Lys | Pro | Asp | Ser | Tyr | Pro | Leu | Phe | Asp | Gly | Ile | Phe | Cys | Ser | | |
| | | | | 85 | | | | | 90 | | | | | 95 | | |
| taa | | | | | | | | | | | | | | | | 291 |

<210> 2
 <211> 95
 <212> PRT
 <213> Artificial Sequence
 <223> Description of Artificial Sequence: SYNTHETIC

B2
400> 2

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Glu | Phe | Asn | Ile | Ser | Gln | His | Gln | Cys | Val | Lys | Lys | Gln | Cys | Pro | Glu | |
| 1 | | | | 5 | | | | 10 | | | | | 15 | | | |
| Asn | Ser | Gly | Cys | Phe | Arg | His | Leu | Asp | Glu | Arg | Glu | Glu | Cys | Lys | Cys | |
| | | 20 | | | | | | 25 | | | | | 30 | | | |
| Leu | Leu | Asn | Tyr | Lys | Gln | Glu | Gly | Asp | Lys | Cys | Val | Glu | Asn | Pro | Asn | |
| | | 35 | | | | | 40 | | | | | 45 | | | | |
| Pro | Thr | Cys | Asn | Glu | Asn | Asn | Gly | Gly | Cys | Asp | Ala | Asp | Ala | Lys | Cys | |
| | 50 | | | | | 55 | | | | | 60 | | | | | |
| Thr | Glu | Glu | Asp | Ser | Gly | Ser | Asn | Gly | Lys | Lys | Ile | Thr | Cys | Glu | Cys | |
| | 65 | | | | 70 | | | | 75 | | | | | | 80 | |
| Thr | Lys | Pro | Asp | Ser | Tyr | Pro | Leu | Phe | Asp | Gly | Ile | Phe | Cys | Ser | | |
| | | | | 85 | | | | | 90 | | | | | 95 | | |

<210> 3
 <211> 279
 <212> DNA
 <213> Plasmodium falciparum

<400> 3
 aacatttcac aacaccaatg cgtaaaaaaa caatgtccag aaaattctgg atgtttcaga 60
 catttagatg aaagagaaga atgtaaatgt ttattaaatt acaacaaga aggtgataaa 120

```
tgtgttgaaa atccaaatcc tacttgtaac gaaaataatg gtggatgtga tgcagatgcc 180
aaatgtaccg aagaagattc aggtagcaac ggaaagaaaa tcacatgtga atgtactaaa 240
cctgattctt atccactttt cgatgggtatt ttctgcagt 279
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<210> 4
<211> 354
<212> DNA
<213> Artificial Sequence
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<220>
<223> Description of Artificial Sequence:SYNTHETIC
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```
<220>
<221> CDS
<222> (1)..(354)
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```
<400> 4
gaa ttc aac atc tcg cag cac caa tgc gtg aaa aaa caa tgt ccc gag 48
Glu Phe Asn Ile Ser Gln His Gln Cys Val Lys Lys Gln Cys Pro Glu
  1             5             10             15

aac tct ggc tgt ttc aga cac ttg gac gag aga gag gag tgt aaa tgt 96
Asn Ser Gly Cys Phe Arg His Leu Asp Glu Arg Glu Glu Cys Lys Cys
                20             25             30
B2
cont.

ctg ctg aac tac aaa cag gag ggc gac aag tgc gtg gag aac ccc aac 144
Leu Leu Asn Tyr Lys Gln Glu Gly Asp Lys Cys Val Glu Asn Pro Asn
  35             40             45

ccg acc tgt aac gag aac aac ggc ggc tgt gac gca gac gcc aaa tgc 192
Pro Thr Cys Asn Glu Asn Asn Gly Gly Cys Asp Ala Asp Ala Lys Cys
  50             55             60

acc gag gag gac tcg ggc agc aac ggc aag aaa atc acg tgt gag tgt 240
Thr Glu Glu Asp Ser Gly Ser Asn Gly Lys Lys Ile Thr Cys Glu Cys
  65             70             75             80

acc aaa ccc gac tcg tac ccg ctg ttc gac ggc atc ttc tgc agc tcc 288
Thr Lys Pro Asp Ser Tyr Pro Leu Phe Asp Gly Ile Phe Cys Ser Ser
                85             90             95

tct aac ttc ttg ggc atc tcg ttc ttg ttg atc ctc atg ttg atc ttg 336
Ser Asn Phe Leu Gly Ile Ser Phe Leu Leu Ile Leu Met Leu Ile Leu
                100             105             110

tac agc ttc att taa taa 354
Tyr Ser Phe Ile
  115
```

<210> 5
 <211> 116
 <212> PRT
 <213> Artificial Sequence
 <223> Description of Artificial Sequence:SYNTHETIC

<400> 5
 Glu Phe Asn Ile Ser Gln His Gln Cys Val Lys Lys Gln Cys Pro Glu
 1 5 10 15
 Asn Ser Gly Cys Phe Arg His Leu Asp Glu Arg Glu Glu Cys Lys Cys
 20 25 30
 Leu Leu Asn Tyr Lys Gln Glu Gly Asp Lys Cys Val Glu Asn Pro Asn
 35 40 45
 Pro Thr Cys Asn Glu Asn Asn Gly Gly Cys Asp Ala Asp Ala Lys Cys
 50 55 60
 Thr Glu Glu Asp Ser Gly Ser Asn Gly Lys Lys Ile Thr Cys Glu Cys
 65 70 75 80
 Thr Lys Pro Asp Ser Tyr Pro Leu Phe Asp Gly Ile Phe Cys Ser Ser
 85 90 95
 Ser Asn Phe Leu Gly Ile Ser Phe Leu Leu Ile Leu Met Leu Ile Leu
 100 105 110
 Tyr Ser Phe Ile
 115

B²
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<210> 6
 <211> 342
 <212> DNA
 <213> Plasmodium falciparum

<400> 6
 aacattttcac aacaccaatg cgtaaaaaaaa caatgtccag aaaatttctgg atgttttcaga 60
 catttagatg aaagagaaga atgtaaatgt ttatttaaatt acaaacaaga aggtgataaa 120
 tgtgttgaaa atccaaatcc tacttgtaac gaaaataatg gtggatgtga tgcagatgcc 180
 aaatgtaccg aagaagattc aggtagcaac ggaaagaaaa tcacatgtga atgtactaaa 240
 cctgattctt atccactttt cgatgggtatt ttctgcagtt cctctaactt cttaggaata 300
 tcattcttat taatactcat gttaatatta tacagtttca tt 342

<210> 7
 <211> 387
 <212> DNA
 <213> Plasmodium falciparum

<220>
 <221> CDS
 <222> (1)..(387)

<400> 7

| | |
|---|-----|
| atg aag gcg cta ctc ttt ttg ttc tct ttc att ttt ttc gtt acc aaa | 48 |
| Met Lys Ala Leu Leu Phe Leu Phe Ser Phe Ile Phe Phe Val Thr Lys | |
| 1 5 10 15 | |
| gaa ttc aac atc tcg cag cac caa tgc gtg aaa aaa caa tgt ccc gag | 96 |
| Glu Phe Asn Ile Ser Gln His Gln Cys Val Lys Lys Gln Cys Pro Glu | |
| 20 25 30 | |
| gaa ttc aac atc tcg cag cac caa tgc gtg aaa aaa caa tgt ccc gag | 144 |
| Glu Phe Asn Ile Ser Gln His Gln Cys Val Lys Lys Gln Cys Pro Glu | |
| 35 40 45 | |
| aac tct ggc tgt ttc aga cac ttg gac gag aga gag gag tgt aaa tgt | 192 |
| Asn Ser Gly Cys Phe Arg His Leu Asp Glu Arg Glu Glu Cys Lys Cys | |
| 50 55 60 | |
| ctg ctg aac tac aaa cag gag ggc gac aag tgc gtg gag aac ccc aac | 240 |
| Leu Leu Asn Tyr Lys Gln Glu Gly Asp Lys Cys Val Glu Asn Pro Asn | |
| 65 70 75 80 | |
| ccg acc tgt aac gag aac aac ggc ggc tgt gac gca gac gcc aaa tgc | 288 |
| Pro Thr Cys Asn Glu Asn Asn Gly Gly Cys Asp Ala Asp Ala Lys Cys | |
| 85 90 95 | |
| acc gag gag gac tcg ggc agc aac ggc aag aaa atc acg tgt gag tgt | 336 |
| Thr Glu Glu Asp Ser Gly Ser Asn Gly Lys Lys Ile Thr Cys Glu Cys | |
| 100 105 110 | |
| acc aaa ccc gac tcg tac ccg ctg ttc gac ggc atc ttc tgc agc taa | 384 |
| Thr Lys Pro Asp Ser Tyr Pro Leu Phe Asp Gly Ile Phe Cys Ser | |
| 115 120 125 | |
| taa | 387 |

<210> 8

<211> 127

<212> PRT

<213> Plasmodium falciparum

<400> 8

| | |
|---|--|
| Met Lys Ala Leu Leu Phe Leu Phe Ser Phe Ile Phe Phe Val Thr Lys | |
| 1 5 10 15 | |
| Glu Phe Asn Ile Ser Gln His Gln Cys Val Lys Lys Gln Cys Pro Glu | |
| 20 25 30 | |
| Glu Phe Asn Ile Ser Gln His Gln Cys Val Lys Lys Gln Cys Pro Glu | |
| 35 40 45 | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asn | Ser | Gly | Cys | Phe | Arg | His | Leu | Asp | Glu | Arg | Glu | Glu | Cys | Lys | Cys |
| 50 | | | | | | 55 | | | | | 60 | | | | |
| Leu | Leu | Asn | Tyr | Lys | Gln | Glu | Gly | Asp | Lys | Cys | Val | Glu | Asn | Pro | Asn |
| 65 | | | | | 70 | | | | | 75 | | | | | 80 |
| Pro | Thr | Cys | Asn | Glu | Asn | Asn | Gly | Gly | Cys | Asp | Ala | Asp | Ala | Lys | Cys |
| | | | | 85 | | | | | 90 | | | | | 95 | |
| Thr | Glu | Glu | Asp | Ser | Gly | Ser | Asn | Gly | Lys | Lys | Ile | Thr | Cys | Glu | Cys |
| | | | 100 | | | | | 105 | | | | | 110 | | |
| Thr | Lys | Pro | Asp | Ser | Tyr | Pro | Leu | Phe | Asp | Gly | Ile | Phe | Cys | Ser | |
| | 115 | | | | | | 120 | | | | | 125 | | | |

<210> 9

<211> 330

<212> DNA

<213> Plasmodium falciparum

<220>

<221> CDS

<222> (1)..(330)

<400> 9

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| gaa | aca | gaa | agt | tat | aag | cag | ctt | gta | gcc | aac | gtg | gac | gaa | ttc | aac | 48 |
| Glu | Thr | Glu | Ser | Tyr | Lys | Gln | Leu | Val | Ala | Asn | Val | Asp | Glu | Phe | Asn | |
| 1 | | | | 5 | | | | 10 | | | | | | 15 | | |
| atc | tcg | cag | cac | caa | tgc | gtg | aaa | aaa | caa | tgt | ccc | gag | aac | tct | ggc | 96 |
| Ile | Ser | Gln | His | Gln | Cys | Val | Lys | Lys | Gln | Cys | Pro | Glu | Asn | Ser | Gly | |
| | | | 20 | | | | 25 | | | | | | 30 | | | |
| tgt | ttc | aga | cac | ttg | gac | gag | aga | gag | gag | tgt | aaa | tgt | ctg | ctg | aac | 144 |
| Cys | Phe | Arg | His | Leu | Asp | Glu | Arg | Glu | Glu | Cys | Lys | Cys | Leu | Leu | Asn | |
| | | 35 | | | | | 40 | | | | | 45 | | | | |
| tac | aaa | cag | gag | ggc | gac | aag | tgc | gtg | gag | aac | ccc | aac | ccg | acc | tgt | 192 |
| Tyr | Lys | Gln | Glu | Gly | Asp | Lys | Cys | Val | Glu | Asn | Pro | Asn | Pro | Thr | Cys | |
| | 50 | | | | | 55 | | | | | 60 | | | | | |
| aac | gag | aac | aac | ggc | ggc | tgt | gac | gca | gac | gcc | aaa | tgc | acc | gag | gag | 240 |
| Asn | Glu | Asn | Asn | Gly | Gly | Cys | Asp | Ala | Asp | Ala | Lys | Cys | Thr | Glu | Glu | |
| 65 | | | | 70 | | | | | | 75 | | | | | 80 | |
| gac | tcg | ggc | agc | aac | ggc | aag | aaa | atc | acg | tgt | gag | tgt | acc | aaa | ccc | 288 |
| Asp | Ser | Gly | Ser | Asn | Gly | Lys | Lys | Ile | Thr | Cys | Glu | Cys | Thr | Lys | Pro | |
| | | | | 85 | | | | 90 | | | | | | 95 | | |
| gac | tcg | tac | ccg | ctg | ttc | gac | ggc | atc | ttc | tgc | agc | taa | taa | | | 330 |
| Asp | Ser | Tyr | Pro | Leu | Phe | Asp | Gly | Ile | Phe | Cys | Ser | | | | | |

100

105

110

<210> 10
 <211> 108
 <212> PRT
 <213> Plasmodium falciparum

<400> 10
 Glu Thr Glu Ser Tyr Lys Gln Leu Val Ala Asn Val Asp Glu Phe Asn
 1 5 10 15
 Ile Ser Gln His Gln Cys Val Lys Lys Gln Cys Pro Glu Asn Ser Gly
 20 25 30
 Cys Phe Arg His Leu Asp Glu Arg Glu Glu Cys Lys Cys Leu Leu Asn
 35 40 45
 Tyr Lys Gln Glu Gly Asp Lys Cys Val Glu Asn Pro Asn Pro Thr Cys
 50 55 60
 Asn Glu Asn Asn Gly Gly Cys Asp Ala Asp Ala Lys Cys Thr Glu Glu
 65 70 75 80
 Asp Ser Gly Ser Asn Gly Lys Lys Ile Thr Cys Glu Cys Thr Lys Pro
 85 90 95
 Asp Ser Tyr Pro Leu Phe Asp Gly Ile Phe Cys Ser
 100 105

B²
 cany.

<210> 11
 <211> 379
 <212> PRT
 <213> Plasmodium cynomolgi

<220>
 <223> Amino Acids 1-139- REGION I

<220>
 <223> Amino Acids 140-177-REGION II

<220>
 <223> Amino Acids 178-282-REGION III

<220>
 <223> Amino Acids 283-379-REGION IV

<400> 11
 Asp Gln Val Thr Thr Gly Glu Ala Glu Ser Glu Ala Pro Glu Ile Ile
 1 5 10 15
 Val Pro Gln Gly Ile Asn Glu Tyr Asp Val Val Tyr Ile Lys Pro Leu
 20 25 30

Ala Gly Met Tyr Lys Thr Ile Lys Lys Pro Leu Glu Asn His Val Asn
35 40 45

Ala Leu Asn Thr Asn Ile Ile Asp Met Leu Asp Ser Arg Leu Lys Lys
50 55 60

Arg Asn Tyr Phe Leu Asp Val Leu Asn Ser Asp Leu Asn Pro Tyr Ser
65 70 75 80

Ile Pro His Ser Gly Glu Tyr Ile Ile Lys Asp Pro Tyr Lys Leu Leu
85 90 95

Asp Leu Glu Lys Lys Lys Leu Leu Gly Ser Tyr Lys Tyr Ile Gly Ala
100 105 110

Ser Val Asp Lys Asp Met Val Thr Ala Asn Asp Gly Leu Ala Tyr Tyr
115 120 125

Gln Lys Met Gly Asp Leu Tyr Lys Lys His Leu Asp Glu Val Asn Ala
130 135 140

Cys Ile Lys Glu Val Glu Ala Asn Ile Asn Lys His Asp Glu Glu Ile
145 150 155 160

B² cont. Lys Lys Ile Gly Ser Glu Ala Ser Lys Ala Asn Asp Lys Asn Gln Leu
165 170 175

Asn Ala Lys Lys Glu Glu Leu Gln Lys Tyr Leu Pro Phe Leu Ser Ser
180 185 190

Ile Gln Lys Glu Tyr Ser Thr Leu Val Asn Lys Val His Ser Tyr Thr
195 200 205

Asp Thr Leu Lys Lys Ile Ile Asn Asn Cys Gln Ile Glu Lys Lys Glu
210 215 220

Thr Glu Thr Ile Val Asn Lys Leu Glu Asp Tyr Ser Lys Met Asp Glu
225 230 235 240

Glu Leu Asp Val Tyr Lys Gln Ser Lys Lys Glu Asp Asp Val Lys Ser
245 250 255

Ser Gly Leu Leu Glu Lys Leu Met Asn Ser Lys Leu Ile Asn Gln Glu
260 265 270

Glu Ser Lys Lys Ala Leu Ser Glu Leu Leu Asn Val Gln Thr Gln Met
275 280 285

Leu Asn Met Ser Ser Glu His Arg Cys Ile Asp Thr Asn Val Pro Glu

290

295

300

Asn Ala Ala Cys Tyr Arg Tyr Leu Asp Gly Thr Glu Glu Trp Arg Cys
 305 310 315 320

Leu Leu Tyr Phe Lys Glu Asp Ala Gly Lys Cys Val Pro Ala Pro Asn
 325 330 335

Met Thr Cys Lys Asp Lys Asn Gly Gly Cys Ala Pro Glu Ala Glu Cys
 340 345 350

Lys Met Asn Asp Lys Asn Glu Ile Val Cys Lys Cys Thr Lys Glu Gly
 355 360 365

Ser Glu Pro Leu Phe Glu Gly Val Phe Cys Ser
 370 375

<210> 12

<211> 380

<212> PRT

<213> Plasmodium vivax-like sp.

<220>

<223> Amino Acids 1-140-REGION I

<220>

<223> Amino Acids 141-178-REGION II

<220>

<223> Amino Acids 179-283-REGION III

<220>

<223> Amino Acids 284-380-REGION IV

<400> 12

Asp Gln Val Thr Thr Gly Glu Ala Glu Ser Glu Ala Pro Glu Ile Leu
 1 5 10 15

Val Pro Ala Gly Ile Ser Asp Tyr Asp Val Val Tyr Leu Lys Pro Leu
 20 25 30

Ala Gly Met Tyr Lys Thr Ile Lys Lys Gln Leu Glu Asn His Val Asn
 35 40 45

Ala Phe Asn Thr Asn Ile Thr Asp Met Leu Asp Ser Arg Leu Lys Lys
 50 55 60

Arg Asn Tyr Phe Leu Glu Val Leu Asn Ser Asp Leu Asn Pro Phe Lys

| 65 | | | | | | 70 | | | | | | 75 | | | | | | 80 |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|----|
| Tyr | Ser | Pro | Ser | Gly | Glu | Tyr | Ile | Ile | Lys | Asp | Pro | Tyr | Lys | Leu | Leu | | | |
| | | | | 85 | | | | | 90 | | | | | 95 | | | | |
| Asp | Leu | Glu | Lys | Lys | Lys | Lys | Leu | Leu | Gly | Ser | Tyr | Lys | Tyr | Ile | Gly | | | |
| | | | 100 | | | | | 105 | | | | | 110 | | | | | |
| Ala | Ser | Ile | Asp | Lys | Asp | Leu | Ala | Thr | Ala | Asn | Asp | Gly | Val | Thr | Tyr | | | |
| | | 115 | | | | | 120 | | | | | 125 | | | | | | |
| Tyr | Asn | Lys | Met | Gly | Glu | Leu | Tyr | Lys | Thr | His | Leu | Thr | Ala | Val | Asn | | | |
| | 130 | | | | | 135 | | | | | 140 | | | | | | | |
| Glu | Glu | Val | Lys | Lys | Val | Glu | Ala | Asp | Ile | Lys | Ala | Glu | Asp | Asp | Lys | | | |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 | | | |
| Ile | Lys | Lys | Ile | Gly | Ser | Asp | Ser | Thr | Lys | Thr | Thr | Glu | Lys | Thr | Gln | | | |
| | | | | 165 | | | | | 170 | | | | | 175 | | | | |
| Ser | Met | Ala | Lys | Lys | Ala | Glu | Leu | Glu | Lys | Tyr | Leu | Pro | Phe | Leu | Asn | | | |
| | | | 180 | | | | | 185 | | | | | 190 | | | | | |
| Ser | Leu | Gln | Lys | Glu | Tyr | Glu | Ser | Leu | Val | Ser | Lys | Val | Asn | Thr | Tyr | | | |
| | | 195 | | | | | 200 | | | | | 205 | | | | | | |
| ² Thr | Asp | Asn | Leu | Lys | Lys | Val | Ile | Asn | Asn | Cys | Gln | Leu | Glu | Lys | Lys | | | |
| <i>B</i> <i>cont.</i> | 210 | | | | | 215 | | | | | 220 | | | | | | | |
| Glu | Ala | Glu | Ile | Thr | Val | Lys | Lys | Leu | Gln | Asp | Tyr | Asn | Lys | Met | Asp | | | |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 | | | |
| Glu | Lys | Leu | Glu | Glu | Tyr | Lys | Lys | Ser | Glu | Lys | Lys | Asn | Glu | Val | Lys | | | |
| | | | | 245 | | | | | 250 | | | | | 255 | | | | |
| Ser | Ser | Gly | Leu | Leu | Glu | Lys | Leu | Met | Lys | Ser | Lys | Leu | Ile | Lys | Glu | | | |
| | | | 260 | | | | | 265 | | | | | 270 | | | | | |
| Asn | Glu | Ser | Lys | Glu | Ile | Leu | Ser | Gln | Leu | Leu | Asn | Val | Gln | Thr | Gln | | | |
| | | 275 | | | | | 280 | | | | | 285 | | | | | | |
| Leu | Leu | Thr | Met | Ser | Ser | Glu | His | Thr | Cys | Ile | Asp | Thr | Asn | Val | Pro | | | |
| | | | | | | 295 | | | | | 300 | | | | | | | |
| Asp | Asn | Ala | Ala | Cys | Tyr | Arg | Tyr | Leu | Asp | Gly | Thr | Glu | Glu | Trp | Arg | | | |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 | | | |
| Cys | Leu | Leu | Thr | Phe | Lys | Glu | Glu | Gly | Gly | Lys | Cys | Val | Pro | Ala | Ser | | | |
| | | | | 325 | | | | | 330 | | | | | 335 | | | | |

Asn Val Thr Cys Lys Asp Asn Asn Gly Gly Cys Ala Pro Glu Ala Glu
 340 345 350
 Cys Lys Met Thr Asp Ser Asn Lys Ile Val Cys Lys Cys Thr Lys Glu
 355 360 365
 Gly Ser Glu Pro Leu Phe Glu Gly Val Phe Cys Ser
 370 375 380

<210> 13
 <211> 380
 <212> PRT
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<220>
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<220>
 <223> Amino Acids 141-178-REGION II

<220>
 <223> Amino Acids 179-283-REGION III

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<400> 13

Asp Gln Val Thr Thr Gly Glu Ala Glu Ser Glu Ala Pro Glu Ile Leu
 1 5 10 15

Val Pro Ala Gly Ile Ser Asp Tyr Asp Val Val Tyr Leu Lys Pro Leu
 20 25 30

Ala Gly Met Tyr Lys Thr Ile Lys Lys Gln Leu Glu Asn His Val Asn
 35 40 45

Ala Phe Asn Thr Asn Ile Thr Asp Met Leu Asp Ser Arg Leu Lys Lys
 50 55 60

Arg Asn Tyr Phe Leu Glu Val Leu Asn Ser Asp Leu Asn Pro Phe Lys
 65 70 75 80

Tyr Ser Ser Ser Gly Glu Tyr Ile Ile Lys Asp Pro Tyr Lys Leu Leu
 85 90 95

Asp Leu Glu Lys Lys Lys Lys Leu Ile Gly Ser Tyr Lys Tyr Ile Gly
 100 105 110

Ala Ser Ile Asp Met Asp Leu Ala Thr Ala Asn Asp Gly Val Thr Tyr
115 120 125

Tyr Asn Lys Met Gly Glu Leu Tyr Lys Thr His Leu Asp Gly Val Lys
130 135 140

Thr Glu Ile Lys Lys Val Glu Asp Asp Ile Lys Lys Gln Asp Glu Glu
145 150 155 160

Leu Lys Lys Leu Gly Asn Val Asn Ser Gln Asp Ser Lys Lys Asn Glu
165 170 175

Phe Ile Ala Lys Lys Ala Glu Leu Glu Lys Tyr Leu Pro Phe Leu Asn
180 185 190

Ser Leu Gln Lys Glu Tyr Glu Ser Leu Val Ser Lys Val Asn Thr Tyr
195 200 205

Thr Asp Asn Leu Lys Lys Val Ile Asn Asn Cys Gln Leu Glu Lys Lys
210 215 220

Glu Ala Glu Ile Thr Val Lys Lys Leu Gln Asp Tyr Asn Lys Met Asp
225 230 235 240

Glu Lys Leu Glu Glu Tyr Lys Lys Ser Glu Lys Lys Asn Glu Val Lys
245 250 255

B2
cont.
Ser Ser Gly Leu Leu Glu Lys Leu Met Lys Ser Lys Leu Ile Lys Glu
260 265 270

Asn Glu Ser Lys Glu Ile Leu Ser Gln Leu Leu Asn Val Gln Thr Gln
275 280 285

Leu Leu Thr Met Ser Ser Glu His Thr Cys Ile Asp Thr Asn Val Pro
290 295 300

Asp Asn Ala Ala Cys Tyr Arg Tyr Leu Asp Gly Thr Glu Glu Trp Arg
305 310 315 320

Cys Leu Leu Thr Phe Lys Glu Glu Gly Gly Lys Cys Val Pro Ala Ser
325 330 335

Asn Val Thr Cys Lys Asp Asn Asn Gly Gly Cys Ala Pro Glu Ala Glu
340 345 350

Cys Lys Met Thr Asp Ser Asn Lys Ile Val Cys Lys Cys Thr Lys Glu
355 360 365

Gly Ser Glu Pro Leu Phe Glu Gly Val Phe Cys Ser

370

375

380

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 <211> 281
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence:ALIGNMENT

<220>
 <223> Amino Acids 1-115-REGION I

<220>
 <223> Amino Acids 116-125-REGION II

<220>
 <223> Amino Acids 126-197-REGION III

<220>
 <223> Amino Acids 198-281-REGION IV

<400> 14
 Asp Gln Val Thr Thr Gly Glu Ala Glu Ser Glu Ala Pro Glu Ile Val
 1 5 10 15

Pro Gly Ile Tyr Asp Val Val Tyr Lys Pro Leu Ala Gly Met Tyr Lys
 20 25 30

Thr Ile Lys Lys Leu Glu Asn His Val Asn Ala Asn Thr Asn Ile Asp
 35 40 45

Met Leu Asp Ser Ala Leu Lys Lys Ala Asn Tyr Phe Leu Val Leu Asn
 50 55 60

Ser Asp Leu Asn Pro Ser Gly Glu Tyr Ile Ile Lys Asp Pro Tyr Lys
 65 70 75 80

Leu Leu Asp Leu Glu Lys Lys Lys Leu Gly Ser Tyr Lys Tyr Ile Gly
 85 90 95

Ala Ser Asp Asp Thr Ala Asn Asp Gly Tyr Tyr Lys Met Gly Leu Tyr
 100 105 110

Lys His Leu Val Lys Val Glu Ile Asp Lys Lys Gly Lys Ala Lys Lys
 115 120 125

Glu Leu Lys Tyr Leu Pro Phe Leu Ser Gln Lys Glu Tyr Leu Val Lys

| | | | | |
|---|-----|-----|-----|-----|
| 130 | | 135 | | 140 |
| Val Tyr Thr Asp Leu Lys Lys Ile Asn Asn Cys Gln Glu Lys Lys Glu | | | | |
| 145 | | 150 | | 155 |
| Glu Val Lys Leu Asp Tyr Lys Met Asp Glu Leu Tyr Lys Ser Lys Val | | | | |
| | 165 | | 170 | 175 |
| Lys Ser Ser Gly Leu Leu Glu Lys Leu Met Ser Lys Leu Ile Glu Ser | | | | |
| | 180 | | 185 | 190 |
| Lys Leu Ser Leu Leu Asn Val Gln Thr Gln Leu Met Ser Ser Glu His | | | | |
| | 195 | | 200 | 205 |
| Cys Ile Asp Thr Asn Val Pro Asn Ala Ala Cys Tyr Arg Tyr Leu Asp | | | | |
| | 210 | | 215 | 220 |
| Gly Thr Glu Glu Trp Arg Cys Leu Leu Phe Lys Glu Gly Lys Cys Val | | | | |
| | 225 | | 230 | 235 |
| Pro Ala Asn Thr Cys Lys Asp Asn Gly Gly Cys Ala Pro Glu Ala Glu | | | | |
| | 245 | | 250 | 255 |
| Cys Lys Met Asp Asn Ile Val Cys Lys Cys Thr Lys Glu Gly Ser Glu | | | | |
| | 260 | | 265 | 270 |
| ^{B³} Pro Leu Phe Glu Gly Val Phe Cys Ser | | | | |
| <i>cont.</i> | 275 | | 280 | |

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<220>
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<400> 15
 Leu Asn Val Gln Thr Gln
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